

COURSE TEMPLATE

1.	Department /Centre proposing the course	Mathematics
2.	Course Title (<i>< 45 characters</i>)	LINEAR ALGEBRA AND APPLICATIONS
3.	L-T-P structure	3 - 0 - 0
4.	Credits	3
5.	Course number	MAL 104
6.	Status (<i>category for program</i>)	DCfor Maths and PLC for Others

7.	Pre-requisites (course no./title)	MAL 101
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8.	Status vis-à-vis other courses (<i>give course number/title</i>)	
8.1	Overlap with any UG/PG course of the Dept./Centre	MAL 503
8.2	Overlap with any UG/PG course of other Dept./Centre	NIL
8.3	Supercedes any existing course	MAL 255

9.	Not allowed for (indicate program names)	Nil
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10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☒ Either sem
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11.	Faculty who will teach the course S. Kundu, R. Sarma, A. Tripathi , SCS Rao and many others.	
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12.	Will the course require any visiting faculty?	No
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13.	Course objective (<i>about 50 words</i>): Basic linear algebra is introduced in the first year course MAL101. MAL255 is designed for mathematics and computing students to have exposure of linear algebra beyond introduction. Application of cetrtain topics of linear algebra in mathematics is also included.	
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14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Introduce Fields: fields of numbers, finite fields. Review basis and dimension of a vector space, linear transformations, eigenvalue and eigenvector of an operator. LU Factorization. Some applications giving rise to Linear Systems Problems Dual and double dual of a vector space and transpose of a linear transformation. Diagonalizability of linear operators of finite dimensional vector spaces, simultaneous triangulization and simultaneous diagonalization. The primary decomposition theorem - diagonal and nilpotent parts.	
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	Inner product spaces, Gram-Schmidt orthogonalization, best approximation of a vector by a vector belonging a given subspace and application to least square problems. Adjoint of an operator, hermitian, unitary and normal operators. Singular Value Decomposition and its applications. Spectral decomposition. Introduction of bilinear and quadratic forms.
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15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
1	Fields: Subfields of the field of complex numbers, Finite fields.	2
2	Review basis and dimension of a vector space, linear transformations, eigenvalue and eigenvector of an operator. LU Factorization. Some applications giving rise to Linear Systems Problems	5
3	Dual and double dual of a vector space and transpose of a linear transformation.	2
4	Diagonalizability of linear operators of finite dimensional vector spaces, simultaneous triangulization and simultaneous diagonalization.	5
5	The primary decomposition theorem - diagonal and nilpotent parts.	4
6	Inner product spaces, Gram-Schmidt orthogonalization, best approximation of a vector by a vector belonging a given subspace and application to least square problems.	5
7	Adjoint of an operator, Self adjoint operators.	4
8	Hermitian, unitary and normal operators.	5
9	Spectral decomposition.	4
10	Singular Value Decomposition and its applications.	3
11	Introduction of bilinear and quadratic forms.	3
12		
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

NA

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
COURSE TOTAL (14 times 'P')		####

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

1. K. Hoffman and R. Kunze, Linear Algebra(2e), Prentice Hall India, 1989.
2. David C. Lay, Linear Algebra and its applications, third edition, Pearson, 2006.
3. Serge Lang, Linear Algebra (undergraduate text in mathematics), 3rd edition, Springer, 1987.

19. Resources required for the course *(itemized & student access requirements, if any)*

19.1	Software	Nil
19.2	Hardware	Nil
19.3	Teaching aides (videos, etc.)	Nil
19.4	Laboratory	Nil
19.5	Equipment	Nil
19.6	Classroom infrastructure	Microphone, Blackboard and Projector.
19.7	Site visits	Nil

20. Design content of the course *(Percent of student time with examples, if possible)*

20.1	Design-type problems	Nil
20.2	Open-ended problems	Nil
20.3	Project-type activity	10%
20.4	Open-ended laboratory work	Nil
20.5	Others (please specify)	Nil

Date: 3-1-2014

(Signature of the Head of the Department)